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THE DIFFERENTIAL DIAGNOSIS OF DISEASES OF THE HEAD OF FOWLS

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Although the several pathological conditions of the head of fowls which have been variously designated as chicken pox, contagious epithelioma, epitheliosis infectiosa avium, avian diphtheria, canker, roup, diphtheritic roup, contagious eye roup, nasal roup, contagious catarrh, colds, etc., have been the subject of much careful study there still appears to exist considerable confusion concerning their relationship. A lack of uniformity of the terms applied by different investigators to the different types of lesions has added to the confusion. In this discussion an attempt will be made to point out the relationship and differential features between these diseases as they occur in California.

To avoid confusion in nomenclature the classification suggested by the writer in a previous paper will be used.

Chicken pox or Contagious Epithelioma.:—This is a readily transmissible disease manifested by the formation of wart-like epithelial tumors on the comb, wattles, or skin of the head. Occasionally lesions are found on the skin of other parts. The sole etiological factor of chicken pox is accepted to be a filterable virus.

The tumors first appear as small, white, blister-like elevations with a smooth surface. As they increase in size the color changes to yellow and finally to dark brown or black and the surface becomes dry and roughened imparting to the tumor a distinct wart-like appearance. At this stage a scab is found which, when removed, leaves a raw, moist surface with numerous indentations. Individual tumors seldom exceed a pea in size. Several tumors, however, may become confluent and thereby appear as a single large lesion. Chicken pox tumors have a very characteristic appearance and are not liable to be confused with lesions due to any other cause.

Canker or Avian Diphtheria.:—Under this heading are included lesions which have been variously designated as roup, diphtheritic roup, contagious eye roup, etc. This disease is manifested by the formation of masses of adherent caseous exudate on the mucous membrane of the mouth and eyes. The etiology of this disease is still a matter of controversy. A number of investigators including Moore (1885)¹⁶, Marshall (1900)¹⁰, Mack (1905)¹³, Bordet and Fally (1910)⁴, and Jackley (1917)¹¹, have attempted to isolate from diseased fowls a specie of bacteria which would prove to be the specific causative organism of canker. In no case, however, has any one specie of organism been isolated which could be unquestionably demonstrated to be the specific causative factor. A close relationship between chicken pox and canker has frequently been noted. Ward²⁰, in 1904, stated that the clinical evidence strongly suggested that chicken pox and canker are etiologically related. Kinsley¹², in 1907, concluded that it was difficult to differentiate between chicken pox and canker and the two may be identical. Haring and Kofoed⁸, in 1912, reported that diphtheritic lesions (canker) in the mouth and throat of fowls may be produced by either diphtheritic material from diseased birds, chicken pox virus, or mechanical injury followed by mixed infection with various organisms. In the canker lesions due to chicken pox virus a microscopical examination showed the presence of the characteristic cell inclusions of contagious epithelioma. Hadley and B. A. Beach⁷, in 1913, believed it reasonable to assume that chicken pox and canker are the same disease manifesting itself in different forms. Mack and Records¹⁴ in 1915, presented evidence to show that chicken pox and canker are etiologically identical but did not draw positive conclusions in this regard. During the same year B. A. Beach, Lothe, and Halpin¹ reported an outbreak of chicken pox and canker in which the high mortality was apparently due to a secondary invading organism. The primary cause, however, was considered to be the filterable virus of contagious epithelioma. The study of Brumly and Snook⁵ reported in 1916, led them to the belief that, although both chicken pox and canker are due primarily to the filterable virus, severe complicating conditions are induced by secondary infection, and that neither factor alone will cause the typical disease. Conclusions regarding the etiological identity of chicken pox and canker, similar to those cited have also been reached by a

number of European investigators including Carnwath⁶ (1907), Schmid¹⁸ (1909), Uhlenhuth and Manteufel¹⁹ (1910), and Ratz¹⁷ (1910). Later investigations and observations by the writer have fully confirmed these observations regarding the relationship of the two diseases and have led to the conclusion that as they occur in California, chicken pox and the most common and most serious form of canker are always associated and are undoubtedly primarily due to the same causative factor, *i. e.*, the filterable virus of contagious epithelioma. However, as already intimated, not all forms of canker are due to this cause. We recognize four distinct forms which, for convenience are classified as *chicken pox canker*, *mechanical canker*, *malignant canker*, and *benign canker*.

Chicken pox canker or avian diphtheria :—As already stated, this disease is considered to be primarily caused by the filterable virus, although secondary invading organisms may play an important part in the development of lesions. Lesions in the mouth first appear as slightly raised, irregularly shaped, yellowish-white patches on the mucous membrane. This is soon followed by the formation of a mass of adherent, yellow, caseous exudate on the surface, which, when removed leaves a raw, bleeding surface. After removal of the exudate another mass usually quickly forms, even though the exposed raw surface is treated with a strong antiseptic such as tincture of iodine. Lesions may appear in any part of the mouth, or pharynx, or on the external or internal surface of the larynx. In fowls having a chicken pox tumor on the beak or at the corner of the mouth, the canker lesions usually first appear on the adjacent mucous membrane.

The early indications of canker in the eye are a reddening of the conjunctiva accompanied by a clear watery discharge. This discharge soon becomes cloudy and viscid and glues the eyelids together. Following this, there is a rapid formation of a mass of yellow caseous exudate within the eyelids. This exudate, except in advanced cases, is not tightly adherent to the mucous membrane and can be readily removed. After removal, however, another mass of exudate usually quickly forms.

As the disease occurs in California, a nasal discharge, a swelling of the infra orbital sinus, or other indications of an involvement of the nasal passages are nearly always absent except in fowls in an advanced stage of the disease or with a mass of the

exudate in the cleft in the hard palate. In all outbreaks observed, chicken pox tumors have been found on some of the diseased birds, although in some cases the percentage of such birds has been small. General symptoms such as depression and loss of appetite are usually not noticeable in affected fowls until the lesions become marked or located so as to interfere with eating or breathing.

Mechanical canker :—This form of canker is characterized by the formation of a mass of yellow caseous exudate in certain parts of the mouth, and in the eyes. It is the result of injury to or irritation of the mucous membrane by foreign bodies such as kernels of grain, weed seeds, barley awns, particles of litter, etc. The irritating object can usually be found within the mass of caseous exudate. It commonly occurs in the cleft in the hard palate, in the larynx, at the corner of the mouth, and in the eyes. As a rule this form of canker can be easily removed without injury to the mucous membrane. Exceptions to this are lesions in the eye which have injured the cornea and lesions at the corner of the mouth produced by penetration of a foreign object into a small pore which opens there. It is not uncommon to find both the eye and cleft involved as a result of the penetration of the foreign body from the eye through the lachrymal duct into the cleft. The stoppage of the lachrymal duct by a foreign body causes a watery discharge from the eye which is called by many poultrymen, "cold in the eye." Lesions in the cleft which cause a stoppage of the nasal passages are accompanied by a nasal discharge. Mechanical canker usually occurs sporadically, although we have observed birds with eye lesions to be sufficiently numerous in some flocks of young chicks to make the trouble resemble an outbreak of an infectious disease.

Malignant Canker :—This is so classified on account of its fatal nature. It is characterized by the formation of a thick mass of yellow caseous exudate which penetrates deeply into the tissues and is accompanied by general symptoms such as marked depression, loss of appetite, and rapid emaciation. The mass of exudate can be easily removed, but thus far no method of treatment has been found that will prevent more exudate from forming in a short time. All cases observed have terminated fatally. Bacteriological examination of the lesions of affected birds has in a few instances revealed the presence of *Bacillus necrophorus*, but otherwise the results have been negative.

Efforts to determine the cause have, therefore, been unsuccessful. However, since the disease is of rather rare occurrence and has shown no tendency to spread from diseased to healthy fowls in the same flock, it is not as yet of much economic importance.

Benign Canker :—This is so classified on account of its apparent harmless nature. It is characterized by the formation of an adherent layer of yellow caseous exudate over restricted areas of the mucous membrane of the mouth. It may occur in any part of the mouth. The lesions have shown no tendency to increase in size nor to be transmissible to other fowls. No method of treatment has been found which will prevent more exudate from again forming after a mass of it has been removed. No causative agent has been found. In spite of the persistent nature of this form of canker, it has not been observed to have any effect on the general health nor to otherwise prove harmful to affected birds, the importance of such lesions is therefore negligible and it is mentioned only because of the similarity of such lesions to chicken pox canker or avian diphtheria.

Colds and Roup :—Under this heading are included only those conditions involving chiefly the nasal passages and which are designated as simple catarrh, contagious catarrh, nasal roup, etc. The disease is manifested by viscid discharge from one or both nostrils which has a tendency to collect in the nasal sinuses, where it undergoes rapid transformation into a caseous mass causing marked swelling of the face beneath the eyes. This trouble has, in general, been considered to be associated with chicken pox and canker rather than as a separate affection. Haring and Kofoed¹¹, in 1912, pointed out that they might be distinct diseases. They observed that an attack of roup does not immunize against chicken pox nor vice versa, and concluded that there is good evidence for believing that roup and chicken pox and canker are two distinct diseases. Experiments and observations by the writer have brought out evidence fully confirming these conclusions. As the disease occurs in California, it is extremely rare to find canker of the mouth or eyes accompanying roup. Even though the sinuses are so distended as to cause the eyes to become entirely closed as a rule, no caseous material is found in them. On the other hand, as previously stated, a nasal discharge is very infrequently associated with chicken pox canker or avian diphtheria unless the canker is located in the cleft in the hard palate. It is very probable that

there are always a few cases of "colds" or roup in all large flocks no matter how well they may be housed and cared for. Thus far, however, any tendency of the diseases to spread and cause an outbreak of roup in any flock that was given proper care, has not been observed. Therefore, roup is not considered to be related to chicken pox, to be a specific infectious disease, nor liable to cause serious losses.

A Nutritional Disease Resembling Roup :—This disease was first described in 1920 by Haring, Jaffa, and the writer in a report of a preliminary investigation of a disease of poultry appearing in many flocks and which, it was believed, had not been previously described. The disease is characterized by weakness, emaciation, a viscid discharge from the eyes followed by the formation of an adherent, white membraneous film over the membrana nictatans and a mass of white caseous material within the conjunctival sacs; a discharge from the nostrils followed by frequent swelling of the infraorbital sinus; the formation of yellowish-white pustule-like lesions from $\frac{1}{2}$ to 2 mm. in diameter in mouth, pharynx and oesophagus; and occasionally the formation of masses of white caseous material in the cleft in the hard palate or elsewhere in the mouth. Frequently the pustules are so numerous as to resemble a false diphtheritic membrane. All of these symptoms, are not commonly observed in any one bird. Postmortem examination usually reveals functional disturbances of the kidneys. These organs are pale and marked with a network of very fine lines which are urate filled tubules. The ureters are frequently greatly distended with urates. Occasionally a deposit of white material, probably urates, is found on the pericardium, the heart, liver, omentum, and intestines. The disease occurs more commonly in pullets than in hens and it is not uncommon to find more than 50% of a flock affected at one time.

Bacteriological examination of dead fowls and attempts to transmit the disease to healthy fowls either by inoculation with material from diseased fowls or by confinement with diseased fowls has in all cases given negative results. The nature of the lesions and failure to demonstrate any causative agent of an infectious nature made it seem very probable that the disease was due to nutritional factors. The correctness of this assumption has been demonstrated by success in controlling the disease in affected flocks by making such changes in rations as a study

of the condition seemed to indicate, and also success in producing the disease by certain methods of feeding. The experiments made thus have demonstrated that the disease may be produced by a shortage of greens. However, no positive evidence regarding other suspected causative factors have been obtained.

The marked similarity of this disease to roup makes it seem very probable that some so-called "outbreaks of roup" may in reality have been this nutritional disease. However, the color of the caseous material which forms in the eyes, the pustule-like nature of the lesions in the mouth and pharynx, the constant association of a nasal discharge or swelling of the nasal sinuses with the lesions in the eyes or mouth makes it easy to differentiate between this nutritional disease and either roup or canker.

Conclusions:—In concluding it is desired to call attention to the following points:

First: That while several forms of canker have been described, only one, chicken pox canker, is of any great economic importance. The other forms are fully described in order to emphasize the fact that the presence of canker lesions is not necessarily an indication of infection with the filterable virus of contagious epithelioma.

Second: That roup, as herein classified, is not an indication of the presence in a flock of any specific infectious disease nor of one liable to cause severe losses in properly cared for flocks.

Third: In dealing with outbreaks of any disease of poultry manifesting itself by lesions resembling roup it should be borne in mind that lesions of this nature may be due to nutritional factors.

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